Human Factors in Training

Human Research Program - Space Human Factors & Habitability
Space Human Factors Engineering Project

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TRAINING DIRECTED RESEARCH PROJECT OVERVIEW

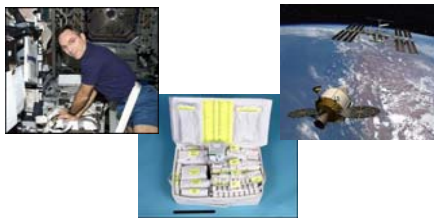
Future space missions will be significantly longer than current Shuttle missions and new systems will be more complex than current systems. Increasing communication delays between crews and Earth-based support means that astronauts need to be prepared to handle the unexpected on their own. As crews become more autonomous, their potential span of control and required expertise must grow to match their autonomy. It is not possible to train for every eventuality ahead of time on the ground, or to maintain trained skills across long intervals of disuse. To adequately prepare NASA personnel for these challenges, new training approaches, methodologies, and tools are required. This research project aims at developing these training capabilities. Training efforts in FY07 strongly focused on crew medical training, but also began exploring how Space Flight Resource Management training for Mission Operations Directorate (MOD) Flight Controllers could be integrated with systems training for optimal Mission Control Center operations. Beginning in January 2008, the training research effort will include team training prototypes and tools.

The Training Task addresses Program risks that lie at the intersection of the following three risks identified by the Project:
- Risk associated with poor task design
- Risk of error due to inadequate information
- Risk associated with reduced safety and efficiency due to poor human factors design

FY07 MEDICAL TRAINING PRODUCTS

Crew Medical Training Review

In FY07, work on medical training focused on identifying the type of training received and issues surrounding medical training for the astronaut crewmembers. The current length of crew training has been identified as a major issue in various crew reports and debriefs and it is predicted that Orion medical training will not increase greatly over what is currently available for Crew Medical Officers (CMOs) – about 70 hours of training, typically one year prior to flight. This work provided a framework of relevant issues for the research team necessary to further specify projected tasks for FY08 and the years beyond. To understand clearly the current philosophy, policy, and practice of crew medical training, analysis was conducted by gathering information from a preliminary review of medical training documents, interviews with trainers, as well as observations of some medical training classes. It is interesting to note that much of the training is hands-on for each particular procedure.



Basic Training Principles - Review of Research Literature

Established Training Principles
- Describes a set of training principles that have a sound basis in empirical research and can be recommended more or less intact for training NASA personnel for future long-term space flights.

Partially Established Training Principles
- Describes principles that have some evidence to support them but need further investigation to establish their general validity.

Other Considerations Relevant to Training
- Reviews evidence related to important issues that might or might not eventually yield new training principles.

Medical Training in Related Domains - Overview

Training Approaches in Relevant Domains:
- Emergency Medical Technicians (EMTs)
- Flight Attendants and Pilots
- Disaster Assistance and Rescue Team

Training Approaches in Analog Domains
- Polar Expeditions
- Underwater Habitats

FY08 MEDICAL TRAINING ACTIVITIES & NEXT STEPS

Constellation (Cx) Program Medical Training Needs Analysis
- Long duration space mission personnel interviews
- Combine lessons learned in FY07 to create recommendations for Cx training needs

Just-in-time Training concepts for medical operations
- Gather information and demonstrations of current JIT training techniques
- Compile a demonstration package highlighting relevant features

Flight Controller Training

Based on the understanding of MOD needs, constraints, and current practices, a conceptual framework for Operationally Oriented Training was developed.
This framework integrates research on adult learning principles, lessons learned in analog domains, and the results of multiple extensive discussions with MOD training and operations personnel.

To improve performance on Space Flight Resource Management (SFRM) skills, to enable early recognition of SFRM challenges, and to increase the overall effectiveness of Flight Controllers' (FCers') training, our framework proposes to introduce SFRM early in the training flow, to integrate SFRM skills with the technical skills, and to provide continuous explicit guidance and feedback on SFRM performance throughout training and operations.

•In FY07, A week-long workshop for MOD management and training leads was hosted at Ames. The workshop resulted in a blue-print for the integration of SFRM into the FCer Training and Certification Flow.
• In FY08, the work focuses on contributing to MOD's Improved Certification Enterprise to implement the integration of SFRM and to measure the effectiveness of the new Training and Certification Flow.

Stakeholders:

Dr. Joseph Schmid, *Lead, Space Medicine Training, Medical Operations, JCS/SD*
John Mccullough, *Chief, Space Flight Training Management Office, JSC/DA7*

(Report – to look like Book)
Space Human Factors Engineering
Training Directed Research Project
PI: Immanuel Barshi, ARC
Other Contributors:
Lucia Arsintescu, ARC and Vicky Byrne, LM-JSC
Report on Current Methods in NASA Crew Medical Training

March 30, 2007

Report (To look like Book)
Space Human Factors Engineering
Training Directed Research Project
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Lucia Arsintescu – SJSU/NASA Ames Research Center, Lyle E. Bourne, Jr. - University of Colorado at Boulder, Vicky Byrne – LM/Johnson Space Center Alice F. Healy - University of Colorado at Boulder, and Vivian I. Schneider - University of Colorado at Boulder
Focused Literature Review Report
June 29, 2007

(Report – to look like Book)
Space Human Factors Engineering
Training Directed Research Project
PI: Immanuel Barshi, NASA Ames Research Center
Training Prototype
September 28, 2007
Operationally Oriented Training – A Conceptual Framework Prototype

Beginning January 2008:

Research on Training for Distributed Teamwork

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